

ASTROPHYSICS

Black hole provides test for Einstein's theory

General relativity seen in action at Milky Way's centre.

BY ALEXANDRA WITZE

Astronomers have caught the giant black hole at the Galaxy's centre stretching the light emitted by an orbiting star — nearly three decades after they first started tracking the star. The long-sought phenomenon, known as gravitational redshift, was predicted by Albert Einstein's general theory of relativity, but until now, it had never been detected in the environs of a black hole.

"It's another big step in getting closer to understanding the black hole," says Heino Falcke, an astronomer at Radboud University in Nijmegen, the Netherlands, who was not involved in the research. "This is just amazing, to be able to see these effects."

A team led by astrophysicist Reinhard

Genzel of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany, reported the discovery on 26 July in *Astronomy & Astrophysics* (R. Abuter *et al. Astron. Astrophys.* **615**, L15; 2018).

Genzel and his colleagues have been tracking the journey of this star, known as S2, since the early 1990s. Using telescopes at the European Southern Observatory in Chile, the scientists watch as it travels in an elliptical orbit around the black hole, 8,000 parsecs (26,000 light years) from Earth. With a mass 4 million times that of the Sun, the black hole generates the strongest gravitational field in the Milky Way. That makes it an ideal place to hunt for relativistic effects.

On 19 May, S2 passed as close as it ever does to the black hole. The researchers traced the star's path using instruments including GRAVITY,

an interferometer that combines light from four 8-metre telescopes. GRAVITY measured S2's movement across the sky; at its fastest, the star whizzed along at more than 7,600 kilometres per second, nearly 3% of the speed of light. A different instrument studied how fast S2 moved towards and away from Earth as the star swung past the black hole. Combining the observations let Genzel's team detect S2's gravitational redshift — which describes how its light is stretched by the black hole's immense gravitational pull. Such a phenomenon is consistent with the predictions of general relativity.

Future observations of S2 might confirm other predictions made by Einstein, such as how a spinning black hole drags space-time around with it.

"Their data look beautiful," says Andrea Ghez, an astronomer at the University of California, Los Angeles, who leads a competing team that uses the Keck telescopes in Hawaii to measure the star's path around the Galactic Centre. It takes 16 years for S2 to make a complete orbit around the black hole, so both groups have been eagerly awaiting this year's close passage. They are still watching the star closely as it slows to its minimum velocity in the line of sight from Earth — another crucial event. "We're in the thick of it," says Ghez. "It's super-exciting." ■

POLICY

US wildlife law in danger

But bills that could strip protections from vulnerable species face resistance from legislators.

BY JEREMY REHM

The US Endangered Species Act — which protects more than 2,000 species of plants and animals, including insects, at risk of extinction — is under renewed attack from Republican politicians. But policy experts say that these efforts face an uphill battle, even though Republicans control the White House and both chambers of Congress.

On 19 July, the US Fish and Wildlife Service (FWS) and the National Marine Fisheries Service (NMFS) proposed policy changes that would, among other things, make it easier to delist species and harder to add new ones. And in recent weeks, legislators in the US House of Representatives have gone further by introducing about 12 bills aimed at altering the law itself.

Some of the bills would roll back protections for species including the American burying beetle (*Nicrophorus americanus*). Lawmakers say that this is to remove barriers to the activities of businesses such as oil companies. Other bills propose fundamental changes to the law, for example by narrowing the range of habitats deemed necessary for organisms to recover.

"The law needs to be updated to ensure it maintains its original intent and focus of species recovery, and not simply serve as a tool for endless litigation," says Representative Rob Bishop, the Utah Republican who heads the House of Representatives Committee on Natural Resources. The committee has spearheaded many of the bills under consideration.

Decisions on whether or not to list a species under the Endangered Species Act (ESA) often draw legal challenges from industry and environmental organizations. Special-interest groups including the oil and gas industry have fought the law since its enactment in the 1970s.

Many conservation scientists and environmental groups say the Republican legislation would cripple the ESA by making it much harder to protect species that are now imperilled. One of the House bills would weaken safeguards for threatened species.

Brett Hartl, government-affairs director

for the Center for Biological Diversity in Washington DC, doubts that the bills will become law — even if the Republicans retain control of the US Senate and the House after the November midterm elections. Similar legislation that has been introduced over the past several years has foundered, he notes.

Hartl worries more about the changes to the ESA proposed in mid-July by the FWS and the NMFS. "Those are very dangerous," he says, because they don't require approval by Congress to take effect. The plans must undergo a 60-day public-comment period before President Donald Trump's administration can finalize the changes and implement them. Hartl thinks that they will probably make it through the process.

But the plan is likely to face lawsuits, says Steve Holmer, vice-president of policy at the American Bird Conservancy in The Plains, Virginia. Litigants could challenge the proposals on several grounds, using arguments that the changes would harm species — in direct opposition to the ESA's original aim.

One of the species that researchers worry about is the endangered American burying ►

"It's pretty much the oil and gas companies that have been looking to have the beetle delisted."